

The amateur was capable of maintaining a note for nearly as long as the professional at 75 mm. Hg. When asked to blow an arpeggio he reached high C but only 110 mm. Hg mouth pressure. The volume of sound produced was less. The maximum pressure produced by the novice was 60 mm. Hg for any recognizable note.

Teachers of musical instruments or singing have curious ideas of anatomy and physiology, and they are apt to spur on their pupils with quite erroneous views on how air is expelled from the chest. It is possible, however, that they achieve success by persuading the pupil to produce uninhibited effort, for when the professional was asked to blow a mercury manometer, an instrument with which he was unacquainted, he could only achieve 80 mm. Hg. On the other hand, the novice, who could blow a trumpet only to 60 mm. Hg, easily blew the mercury to 160 mm., for he had many years' practice at this procedure (Fig. 4). These results

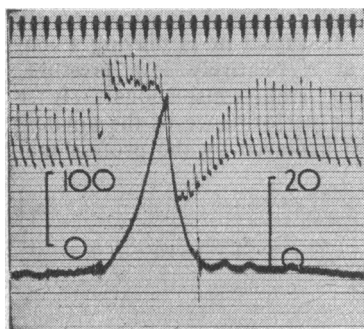


FIG. 4.—A mercury manometer is blown to 160 mm. Hg for 6 seconds. Upper curve, arterial pressure. Lower curve, forearm venous pressure.

suggest that it might be useful to record mouth or intrathoracic pressures during training in order to demonstrate errors in technique.

The trumpet appears to be the instrument requiring the highest intrathoracic pressures. Oboe players reach 60 mm. Hg only occasionally, while the amateur recorded 40 mm.

Hg mouth pressure when playing loud high notes on the French horn. Although trumpet playing produces high intrathoracic pressures compared with other instruments and normal straining, it still does not approach the pressure levels induced by coughing. Over 200 mm. Hg is common in well-built males, and 450 mm. Hg for many seconds has been recorded (Sharpey-Schafer, 1953).

Apart from the discomfort of occasional dizzy sensations or black-outs, trumpet players are not likely to come to any harm. Vasodilatation from heat or previous hyperventilation will exaggerate the effects of a given intrathoracic pressure. It is better to sit than stand, but the strict supine posture, which would be better still, seems hardly feasible. For orchestras in severe financial difficulties it might be possible to dispense with the assistant or "mate" if the trumpeter wore a pilot's pressure-suit, which could be surreptitiously inflated by a switch on the conductor's desk.

Summary

Continuous mouth and arterial pressures were recorded during trumpet playing. A professional reached 160 mm. Hg blown pressure on loud high notes; less skilled performers were unable to reach such pressures. The circulatory effects of prolonged playing were those of a formidable Valsalva manoeuvre. Dizziness or black-out may result.

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ON RUBELLA IN PREGNANCY

BY

JULIA BELL, M.A., F.R.C.P.

From the Galton Laboratory, University College

In the fifth James Mackenzie Lecture Dr. G. F. Abercrombie (1959) described the following sequence of events experienced by a patient who had sought his advice: "A lady, 14 weeks pregnant, and her 4-year-old daughter, simultaneously developed german measles. The mother knew all there was to be known at that time about pregnancy and german measles, and I immediately obtained confirmation of the diagnosis from a dermatologist. Thence to an obstetrician who, though clearly in favour of terminating the pregnancy, asked that his opinion be confirmed by a colleague. The second was just as hesitant as the first, and I had finally to take her to a physician before the operation could be done. This physician simply said, 'You can't do anything else.'" Yes, indeed; by this time, having been to five doctors, none of whom could reassure her or allay her fears, there could be no alternative, for psychological reasons if for no others.

Dr. Abercrombie does not state when he saw this patient. If it was as far back as 1940-5 the doubt and hesitation on the part of her advisers was understandable, and even commendable, but to publish such an account to-day, as if such conduct of a case may still be excusable, seems to me to be unfortunate and possibly to invite the recurrence of doubt and hesitancy on the part of other practitioners presented with the problem.

Suggestions for the G.P.

Having considered this problem in some detail, I think that, though no definite calculation of the risks involved is yet possible, we are able to suggest certain rules for the guidance of the practitioner until more exact facts can be given, so that he should no longer have to consult colleagues who really know no more on the subject than he does; for though Dr. Abercrombie apparently scorns statisticians and refuses to take notice of percentages, in such a problem only statistics can give the help needed. He is right, however, to be cautious in accepting a simple percentage as a guide without careful consideration of the material on which it is based, on the numbers concerned, and on the snags involved, which may differ from one sample of material to another and which do make this particular problem a very elusive one.

Now the facts of the situation have accumulated so that one can state without doubt that rubella in the early weeks of pregnancy is such a menace to the normal development of the foetus that it constitutes a risk one cannot allow to be taken for the unborn child. Abortion has become the generally recognized treatment in such a case; to such an extent has this become routine treatment that maybe we can no longer hope to get a measure of the risk involved or discover what proportion of such occurrences can be expected to result in a normally developed child. The important question we have to decide is at what stage of pregnancy the occurrence of rubella constitutes no menace to the child, or so small a risk that routine abortion can no longer be justified. I would, in the present state of our knowledge, suggest 12 weeks as the limiting time; a patient coming

up for advice with a history of rubella after this date should be reassured and abortion should no longer be prescribed as a routine measure and should be permitted only if the nature of the individual case required it.

I have collected from the literature accounts of 712 cases of rubella during pregnancy giving, not percentages of resulting defect, but histories of each experience, with a report on the condition of the child. Such material is, for the most part, highly selected by one factor or another which is likely to differ from one source of material to another, so that any conclusions drawn from it are not of general application and should be drawn—and received—with great caution. However, I think the summary given in the accompanying Table is of great interest and may provide pointers to those who have to make decisions in such cases.

It will be seen from the Table that cataract was noted in 149 cases, deafness in 263, and congenital heart disease in 210. In addition, 70 children were reported to show defects other than the three characteristic ones, which either were absent or the child died before they could be discovered. Of these, 36 were either stillborn or miscarried, or abortion had been produced; defects in the remaining 34 were varied and probably unrelated to the occurrence of the maternal rubella.

A further 221 children of the series were believed to be normal at the time of observation; 94 of them had a history of maternal rubella before or at the twelfth week of pregnancy, and 59 of these were known to be over the age of 2 years at the time of observation.

Sources of Information

And now a word about this material, which in the main is derived from four chief sources.

1. *Information collected from maternity hospitals at the time of birth or shortly after, rubella having been said to occur during pregnancy.*—If cataract has resulted, with or without the frequently associated microphthalmia, this anomaly would be evident; congenital heart disease might be diagnosed, but I suspect that in many cases the diagnosis might be reversed if the infant were seen again at a later date; the third characteristic defect—namely, deafness—would not be revealed at this age. Thus the only reliable information so provided concerns cataract, which would be unlikely to escape recognition whatever the source, and 149 examples of the defect in the records of 712 cases probably provide a maximum incidence.

2. *Information obtained by questionnaires to parents of school entrants at the age of 6 years.*—This material is

selective in that all the children who died before the age of 6 years or who were too handicapped by their defects to attend the ordinary schools are excluded from the records, and thus the figures are heavily weighted in favour of normal children, but they do provide evidence of the fact that rubella, even in early pregnancy, does not necessarily result in a defective child. There must, I think, be some doubt whether the mother of a child aged 6 can remember the week of pregnancy in which she developed rubella so long ago.

3. *Information obtained by routine inquiry in special hospitals for the deaf, for eye diseases, or for congenital heart disease.*—This information is selective in that every child is defective: no normally developed child appears in the records, and thus the figures of defect are heavily overweighted. This is particularly marked in respect of information from schools or institutions for the deaf, and must contribute largely to the excess of cases of deafness amongst the records; but the material is valuable in that the child under observation has reached an age at which all the three characteristic defects would be clearly developed if present. The doubts one may feel with regard to my large numbers for deafness alone in the population concerned bring up the question whether the deafness in so large a proportion of the cases, though associated with a history of maternal rubella during pregnancy, is in fact always causally related to it. That in so many of these cases the maternal affection had occurred in the first three months of pregnancy does suggest a causal relationship, but we should view with some doubt the aetiology of the relatively few cases noted in the later categories. It is of interest that relatively few examples of deafness in this series are associated with cataract or suspected heart disease; which again leads to the suggestion that perhaps the amount of deafness revealed in the material concerning very young children has been underestimated and that doubtless more of this defect would become evident if these cases were reviewed at a later date.

4. *Other sources of information.*—These include reports of cases in medical journals and questionnaires circulated—for example, to doctors or to women who have had rubella during pregnancy. None of these are free from selection, but all tend to exaggerate the risk involved and to minimize the numbers of normally developed children in the population concerned. A routine investigation being carried out by Dr. Pitt in Melbourne and one by Professor Bradford Hill in this country should lead to unselected samples of material in the years ahead, referring to cases in which abortion has not been induced.

Summary of Defects Occurring in 712 Cases of Rubella during Pregnancy

Defect Noted in Child	Week of Pregnancy in which Rubella Occurred												Total
	1-4		5-8		9-12		12-16		> 16		?		
	a	b	a	b	a	b	a	b	a	b	a	b	
Cataract only	9	7	8	1	—	2	—	—	—	3	—	—	30
„ and heart anomaly ..	27	8	18	18	3	4	—	—	—	—	—	—	78
„ „ deafness	2	3	1	3	—	1	—	—	—	—	—	1	11
„ heart anomaly, and deafness	4	10	5	10	1	—	—	—	—	—	—	—	30
Deafness only	1	13	1	74	—	62	—	14	—	4	—	1	170
„ and heart anomaly ..	—	9	1	20	2	14	1	3	—	—	—	2	52
Congenital heart disease only ..	4	6	4	11	6	5	2	5	2	5	—	—	50
Total	47	56	38	137	12	88	3	22	2	12	—	4	421

a=Children observed under the age of 2 years. b=Children observed aged 2 years and over.

This report, then, can be regarded as an interim account only, based on the examination of some 100 published papers on the subject. A further and more detailed investigation is in progress.

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DEAF OR DEAD?

A CASE OF SUBACUTE BACTERIAL ENDOCARDITIS
TREATED WITH PENICILLIN AND NEOMYCIN

BY

C. W. H. HAVARD, B.M., M.R.C.P.

LAWRENCE P. GARROD, M.D., F.R.C.P.

AND

PAMELA M. WATERWORTH, F.I.M.L.T.

From the Departments of Medicine and Pathology,
St. Bartholomew's Hospital, London

The following is the history of a patient who had to be warned that the treatment necessary to save his life would probably cause severe deafness. He accepted this consequence, and suffered it, but he is alive and well nearly a year later. The history also illustrates the value of tests of combined antibiotic bactericidal action in difficult cases of bacterial endocarditis.

Case Report

A police inspector aged 47 was admitted to St. Bartholomew's Hospital on February 8, 1958, complaining of not having felt well since December 4, 1957, when his urethral stricture (dating from 1946) had been dilated in this hospital. For several weeks past he had suffered from fever and night sweats, and for several days had noticed increasing lethargy and debility.

Physical examination revealed a well-built man (205 lb.—93 kg.) who was febrile (100° F.—37.8° C.) and obviously ill. There was no clinical cardiac enlargement, but examination of the heart showed evidence of a severe degree of aortic incompetence. The pulse frequency was 90 a minute and the pulse wave collapsing. The blood pressure was 130/50; a grade IV aortic diastolic murmur was conducted down the left border of the sternum, and the musical character of this murmur suggested rupture of an aortic cusp. A number of subungual splinter haemorrhages were visible, but there was no finger-clubbing and the spleen was not palpable. The urine contained no abnormal constituent, and microscopy of a centrifuged deposit revealed a few white and red blood cells only. The E.S.R. was 76 mm. in one hour (Westergren); the haemoglobin was 11 g./100 ml., the white blood count was normal, and the blood urea was 22 mg./100 ml. An E.C.G. and a chest x-ray examination were normal.

Bacteriological Findings.—A blood culture on the day of admission grew *Streptococcus faecalis*. This organism had a normal degree of sensitivity to penicillin (inhibition by 4 units/ml.) and to other antibiotics except tetracycline and streptomycin; the minimum inhibitory concentration of streptomycin was 50,000 µg./ml. (It was later verified that the *Str. faecalis* in his faeces was also highly resistant to streptomycin.) Tests of combined bactericidal action by the method of Martin, Sureau, and Chabbert (1952) showed that no combination of penicillin, streptomycin, tetracycline, chloramphenicol, erythromycin, novobiocin, vancomycin, or bacitracin, or any of these singly, completely sterilized the inoculum. A further experiment was done in which serial viable counts were made by an accurate method, using the more promising six antibiotics or combinations in a

concentration of 10 µg./ml. (penicillin 10 units/ml.), whether alone or in combination. The following were the mortalities after 24 hours: penicillin, 99.75%; erythromycin, 51%; vancomycin, 69%; penicillin + erythromycin, 60%; penicillin + vancomycin, 81%; Penicillin + streptomycin, 99.85%.

From this it appeared that penicillin alone was as effective as anything else, and treatment, which from February 10 had consisted of penicillin, 1 mega unit six-hourly, and streptomycin, 1 g. b.i.d., was continued from February 14 with penicillin only (2.5 mega units six-hourly) supplemented by probenecid, 0.5 g. q.d.s. This regime was continued for six weeks.

After four days the patient became and remained afebrile. His immediate progress was uneventful. The E.S.R. had fallen to 20 mm. in one hour by the end of the sixth week, and he not only felt restored to complete health but had gained 2.3 kg. in weight. The musical character of the aortic diastolic murmur had gradually disappeared, and the diagnosis of subacute bacterial endocarditis on a bicuspid aortic valve with rupture of one of the cusps seemed to be beyond dispute. No signs of relapse appeared over a further week of observation, and he was discharged from hospital on April 2.

Relapse

Two weeks after leaving hospital he complained of dysuria, and a few days later the night sweats and lethargy returned. On April 26 he was readmitted to hospital. He was febrile (101° F.—38.3° C.) and obviously ill, but the physical signs were essentially unchanged. The blood pressure was 130/50 mm. Hg and there was a definite though slight increase in the heart size. Microscopy of the urine revealed an excess of leucocytes and a few red blood cells; culture was sterile. The E.S.R. was 60 mm. in one hour, the haemoglobin was 8.9 g./100 ml., and the white blood count 7,200/c.mm., with a normal differential count. The blood urea was 23 mg./100 ml. and the urine concentration and dilution tests were normal.

Bacteriological Findings.—Blood cultures made on April 26 and 27 yielded a profuse growth of *Str. faecalis* (187 and 190 colonies per ml. in pour plates). This organism and that isolated originally were sent to Dr. S. D. Elliott, who kindly reported that they were identical, belonging to his type D 15, which is the type 9 of Sharpe and Shattock (1952). It was still inhibited by 4 units of penicillin per ml., but killed by penicillin much more slowly. The only remaining resource appeared to be neomycin. Although the organism grew in 10 µg. of this antibiotic per ml. (the minimum inhibitory concentration was 16 µg./ml.), either 5 or 10 µg. of neomycin per ml. combined with 10 units of penicillin per ml. proved to be completely bactericidal. This was the only combination found to sterilize the inoculum (of about 10⁸ streptococci per ml.) in all the tests made.

Treatment with penicillin, 2½ mega units six-hourly, streptomycin, 1 g. daily, and probenecid, 0.5 g. t.i.d. was started on April 28. By May 6 the full laboratory findings were available, and intramuscular neomycin, 0.5 g. eight-hourly, replaced the streptomycin and probenecid, the patient's consent having been obtained for the use of a drug which would probably make him deaf. He became and remained afebrile after five days' treatment.

Assays of the antibiotics in four specimens of blood on May 7 and 8 showed a penicillin content varying from 23 to 5 units/ml. and of neomycin from 32 to 8 µg./ml. according to the interval since the last dose.

After 10 days' treatment with neomycin granular casts were noticed on microscopy of the urine, and after two weeks albumin was detected on routine testing. By the end of 34 days the blood urea had risen to 63 mg./100 ml. However, this was transient, and within one month of discontinuing the neomycin the blood urea had fallen to 40 mg./100 ml. and there were no casts on microscopy of the urine.